Forest Products Laboratory

Our mission

We use science and technology to conserve and extend our Nation's forest resources. Our mission is to promote healthy forests and forest-based economies through the efficient, sustainable use of our wood resources. Many breakthrough technologies that influence the way we live started at the Forest Products Laboratory (FPL).

Our role and experience

Established in 1910 by the U.S. Department of Agriculture Forest Service, the FPL in Madison, Wisconsin, serves the public as the Nation's leading wood research institute. The FPL is recognized both nationally and internationally as an unbiased technical authority on wood science and use. Our research is concentrated in one location to promote an interdisciplinary approach to problem solving. The FPL cooperates with many universities, industries, and federal and state agencies.

Our areas of expertise

Today, more than 230 scientists and support staff conduct research on expanded and diverse aspects of wood use. Research concentrates on pulp and paper products, housing and structural uses of wood, wood preservation, wood and fungi identification, and finishing and restoration of wood products.

In addition to traditional lines of research, FPL is responding to environmental pressures on the forest resource by using cutting-edge techniques to meet important future challenges:

- Utilization of small-diameter timber
- Nanotechnology
- Biorefinery/bioenergy
- Advanced wood structures
- Advanced composites

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Durability and Wood Protection

Wood Preservation and Biodeterioration Research

at the **Forest Products Laboratory**

USDA

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

Wood Preservation and Biodeterioration Research

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Forest Products Laboratory

Research on protecting wood from biological degradation was among the earliest work at the Forest Products Laboratory, and this research has successfully reduced the need to repeatedly replace existing wood products.

Today, our research continues to address the changing needs of industry and consumers of wood and wood products. Continued advances will lead to improved performance and durability of treated wood products.

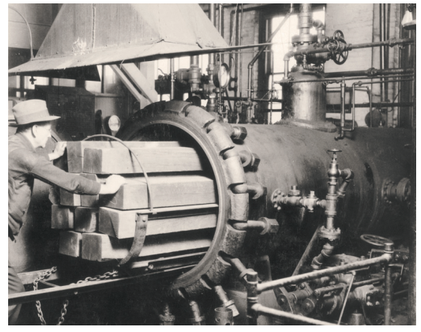
Our research areas include the following:

- New, environmentally acceptable preservative treatments
- Treatability of underutilized wood species
- Understanding fungal tolerances to preservative systems
- Termite control
- Assessing the effects of preservatives released into the environment
- Natural durability of native and tropical wood species

About 10% of the annual timber cut in the United States, much of it from our National Forests, goes to replace wood structures deteriorated by decay fungi and insects.

The market for treated wood is significant. In 2001, 42% of southern pine production was converted to treated wood.

Treated wood is a desirable construction material for residential, nonresidential, transportation and recreational structures.



Early wood preservation research work.

Present-day treatment facility.

Durability and Wood Protection

Wood Preservation and Biodeterioration Research

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Scientific approach

A large portion of our research is conducted in formal or informal cooperation with other parties, such as other government agencies, universities, industry associations, chemical companies, treating companies, and developers of new treatments. Project researchers are active in the American Wood Preservers' Association, International Research Group on Wood Protection (IRG), Forest Products Society, and Society for Industrial Microbiology.

Assessing and reducing release of preservatives into the environment

Soil sampling.

Improvements in preservative-treated wood are critical to ensure that treated wood does not adversely affect water quality. This is particularly important when using treated wood to construct recreational structures such as boardwalks in environmentally sensitive wetlands. We must reduce the environmental impact of treated forest products through improvements to current preservatives and development of new environmentally compatible preservatives.

Evaluating the use of treated wood in sensitive environments.

Preservatives with lower environmental impact.

Artificial rain machine.

Research highlights

- Evaluate influence of coating composition on leaching of chemicals from treated wood
- Model preservative leaching in above-ground applications
- Investigate long-term soil accumulation of leached preservative from wood used in above-ground applications and in-ground contact
- Explore alternative methods of impregnating chemicals
- Develop environmentally preferable methods for recycling treated wood

Developing environmentally compatible preservative treatments

Damage caused by Formosan termites after only 6 months.

The use of CCA and two other primary preservatives (creosote and pentachlorophenol) continues for many industrial and commercial applications. These conventional preservatives and the newer copper-based systems will face increasing environmental pressures. If the use of these existing preservatives is to continue, the environmental concerns and effects associated with them need to be addressed and minimized. In addition, new more environmentally compatible preservatives are needed to replace conventional broad-spectrum pesticides. Future wood preservatives must rely less heavily on heavy metals or be required to contain only organic compounds. One way to reduce the impact is to target the treatment to specific applications (i.e., above-ground or in-ground) in specific hazard class environments. One example of a specific application is treated wood products in geographical areas affected by invasive Formosan termites.

Advanced housing demonstration and research facility.

Laboratory termite evaluation.

Field stake test.

Research highlights

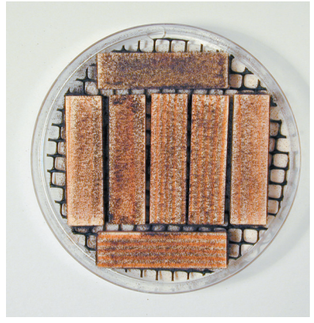
- Use biocide combinations to provide synergistic effects at reduced chemical levels
- Evaluate low-level copper systems
- Identify and evaluate preservatives free of heavy metals
- Evaluate the role of biopreservatives in wood protection systems
- Evaluate naturally durable wood species for decay and termite resistance
- Develop a better understanding of mechanisms of inhibition and control of both decay and mold fungi and termites

Treating a diverse range of wood species and underutilized small-diameter materials

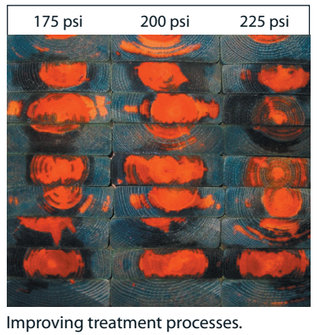
Treatment of underutilized species.

Maintaining diverse species in our National Forests is crucial to improving forest health. Thus, it is beneficial to increase the market potential of a range of hardwood and softwood species. Such markets can be improved by treating wood products with preservatives. Because removing excess biomass reduces wildfire hazard as part of the National Fire Plan, we need to develop low-cost treatment options and value-added markets for small-diameter materials. Southern pine is the dominant species used for treated wood. The Forest Service must improve the ability to treat and document the durable performance of a diverse range of species for treated wood applications.

Field treatments to preserve covered bridges.



Laboratory mold evaluation.



Improving treatment processes.

Research highlights

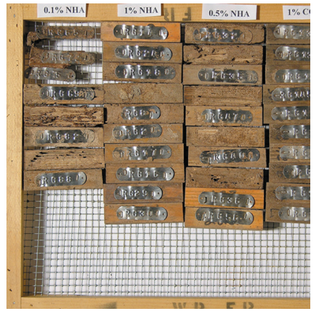
- Evaluate and periodically summarize efficacy of preservatives in softwoods and hardwoods in long-term field studies
- Assess treatability and durability of underutilized species with both conventional and alternative preservative systems
- Assess non-pressure options for treating small-diameter materials and other applications, including surface treatments for mold prevention
- Investigate field-applied remedial treatments for wood in transportation structures, such as covered bridges

Developing accelerated test methods to predict performance of new preservatives

Colonization by a copper-tolerant fungus.

New wood preservatives must demonstrate considerable performance for us to bring them to the marketplace. Current methodologies to determine the durability of test specimens are inefficient because long-term field testing is required to ensure that a treatment is effective. Accelerated test methods to predict performance would reduce the time needed for development and acceptance of new preservatives. With today's urgency to develop environmentally friendly preservative treatments, we need improved methods of data evaluation and analysis for timely and accurate prediction of long-term performance of durable forest products.

Evaluating protection against termite attack.



In-ground termite assessment test.

Above-ground test method.

Research highlights

- Correlate fungal cellar results to field data
- Develop laboratory mold detection methodologies
- Refine mechanical testing for early decay detection
- Develop electromagnetic methods and bioattractants for termite detection
- Apply immunodiagnostics for rapid detection of incipient decay in field tests
- Accelerate above-ground testing with modified lap and L-joints
- Evaluate new copper organics with copper-tolerant brown-rot fungi
- Improve statistical analysis of exposure data from field plots
- Evaluate termite baiting methods for colony elimination